SERVICE
MANUAL

THE BAIR HUGGER® PATIENT WARMING SYSTEM

200/500 SERIES

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Definitions of Symbols

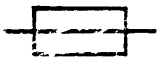
On (used on isolation switch)

Off (used on isolation switch)

On (system on - not main power to unit)

Off (system off - not main power to unit)

Equipotentiality plug (Ground)



Fuse

Warning - See appropriate documents

Non Explosion Proof

Dangerous Voltage

Type BF Equipment (Patient Applied)

VAC Alternating Current

IMPORTANT

The Bair Hugger® Patient Warming System is patented and thermally balanced, assuring maximum heat transfer and safety. Failure to use a Bair Hugger Warming Blanket with the Bair Hugger Warming Unit could result in hot spots or exposure to temperatures outside the indicated range. Augustine Medical Inc.'s lifetime warranty is only valid when using Bair Hugger Warming Blankets with Bair Hugger Warming Units.

CAUTION: The repair, calibration and servicing of the Bair Hugger Patient Warming System requires the skill of a qualified Medical Equipment Service Technician familiar with good practice for medical device repair. Improper repair can result in patient injury. If service is designated as not requiring manufacturer's attention, the technical information required to perform the service will be provided, upon request, by Augustine Medical, Inc.

There are electrically live parts within the Unit when it is connected to the power source, even when the front panel switch is in the "OFF" position.

READ BEFORE SERVICING EQUIPMENT

Perform all repairs and maintenance in accordance with the instructions in this Bair Hugger Patient Warming System Service Manual.

Perform a safety inspection after making repairs to the Bair Hugger Warming Unit before returning the Warming Unit to service. A safety inspection should include a test of the over temperature alarm system and a leakage current test.

GENERAL MAINTENANCE

The Bair Hugger® Patient Warming System requires little maintenance: wiping the cabinet, cleaning the hose, and regularly changing the air filter.

Cleaning the Cabinet

To clean the Bair Hugger Patient Warming System cabinet, use a soft cloth, lightly dampened with water.

1. Unplug the Unit.

2. Do not use a dripping wet cloth to clean the Unit. Moisture may seep into the electrical contacts, damaging the components.

3. Do not use alcohol or other solvents to clean the cabinet. Solvents may damage the labels and other plastic parts.

Shock Hazard:

Do not disassemble the Unit. Refer servicing to an Augustine Medical, Inc. Authorized Service Center or contact:

Augustine Medical, Inc.
10393 West 70th Street
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Tel: (612) 941-8866
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HOSE REPLACEMENT (200 SERIES)

1. Remove the hose anchor screw at the blower outlet (See Figure 1).

2. Pull the old hose off the blower outlet flange.

3. A hose end with pre-drilled holes must be inserted into the blanket.

4. Attach and secure the hose anchor screw.

HOSE REPLACEMENT (500 SERIES)

1. Grasp the hose at the base and pull free from the hose coupling flange.

2. A hose end with pre-drilled holes must be inserted into the blanket.

FUSE REPLACEMENT (200 SERIES)
(Units Not Equipped with a Power Entry Module, See Figure 1)

The main power fuses are located inside the wiring shield in the hose storage compartment. They are labeled with the appropriate replacement fuse capacity.

1. Make sure to disconnect power to the Unit before replacing the fuses.
   NOTE: Replace only with fuse capacity indicated on equipment.

2. To replace the fuses, remove the wiring shield by unscrewing the three Phillips head screws (See Figure 1).

3. Unscrew the fuse holder cap, remove the old fuse, and insert the new one.

4. Replace the fuse holder cap and the wiring shield.

POWER FUSE REPLACEMENT
(Units Equipped with a Power Entry Module, See Figure 1)

In Units equipped with a power entry module, the power fuses are located in the power entry module (See Figure 1).

1. The power cord will need to be removed to gain access to fuses. Before removing power cord, be sure the Unit is disconnected from power source.

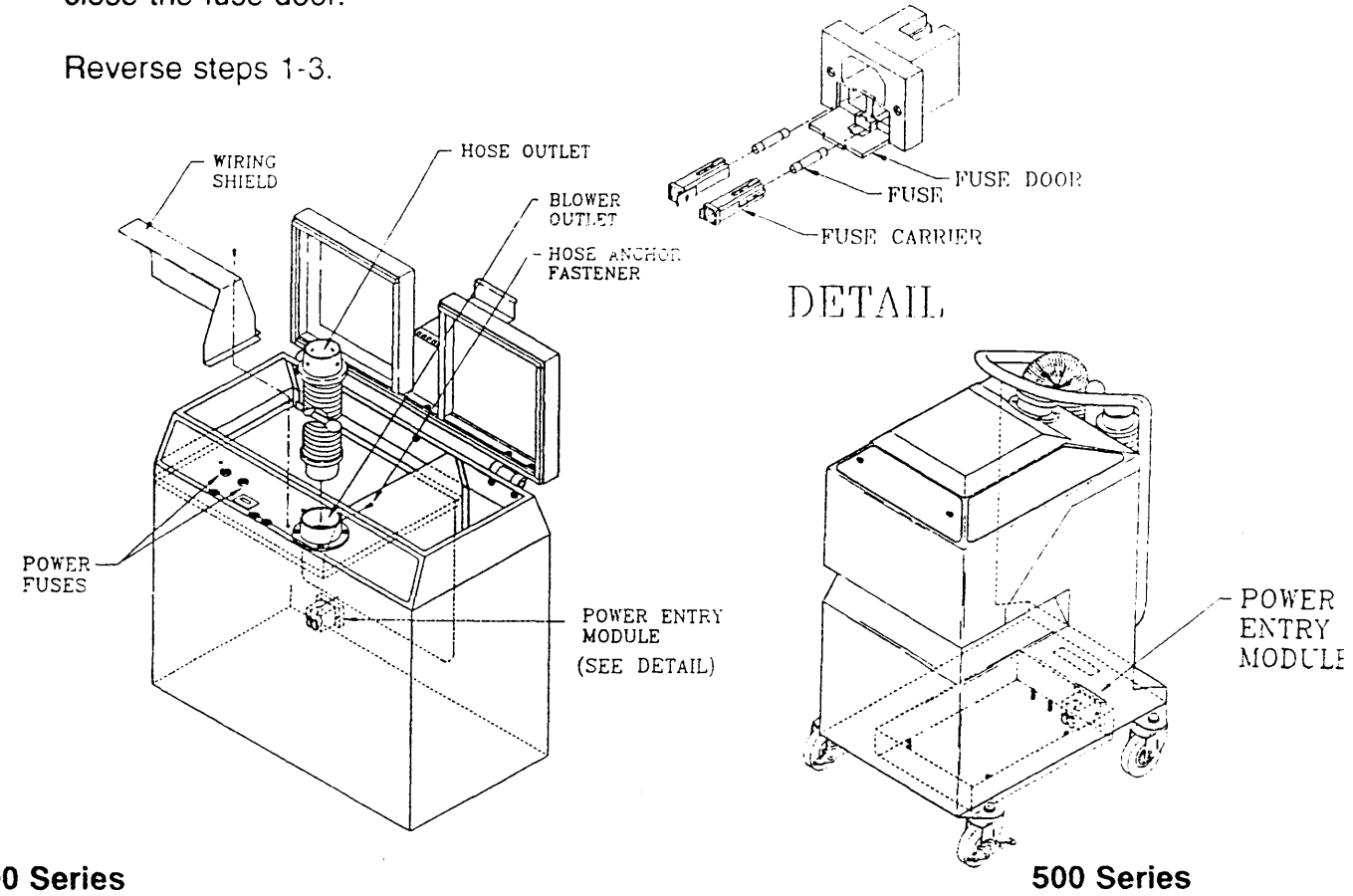
2. To remove the power cord, remove the two Phillips head screws securing the cord retainer.

3. Detach the cord and locate the fuse door.

4. With a small tool (i.e. small screw driver or needle nose pliers) open the fuse door and remove the fuse carriers from the carrier socket.

5. Replace the fuse as marked into the fuse carriers. **Note: Replace only with fuse capacity indicated on the Unit.** Replace the fuse carriers into the socket and close the fuse door.

6. Reverse steps 1-3.



200 Series **500 Series**

Figure 1. Location of Power Fuses

CONTROL BOARD FUSE REPLACEMENT (200 SERIES)

The control board fuse is located on the control board (See Figure 2).

Disconnect power from Unit before servicing.

1. Open rear access panel of Warming Unit by removing the four Phillips head screws.
2. Remove the filter.
3. Remove the lower filter seat angle (See Figure 3) by removing the three T25 black torx screws.
4. Identify the control board (See Figure 3).
5. Locate the fuse (See Figure 2) and replace as specified.
6. Reverse steps 1-3.

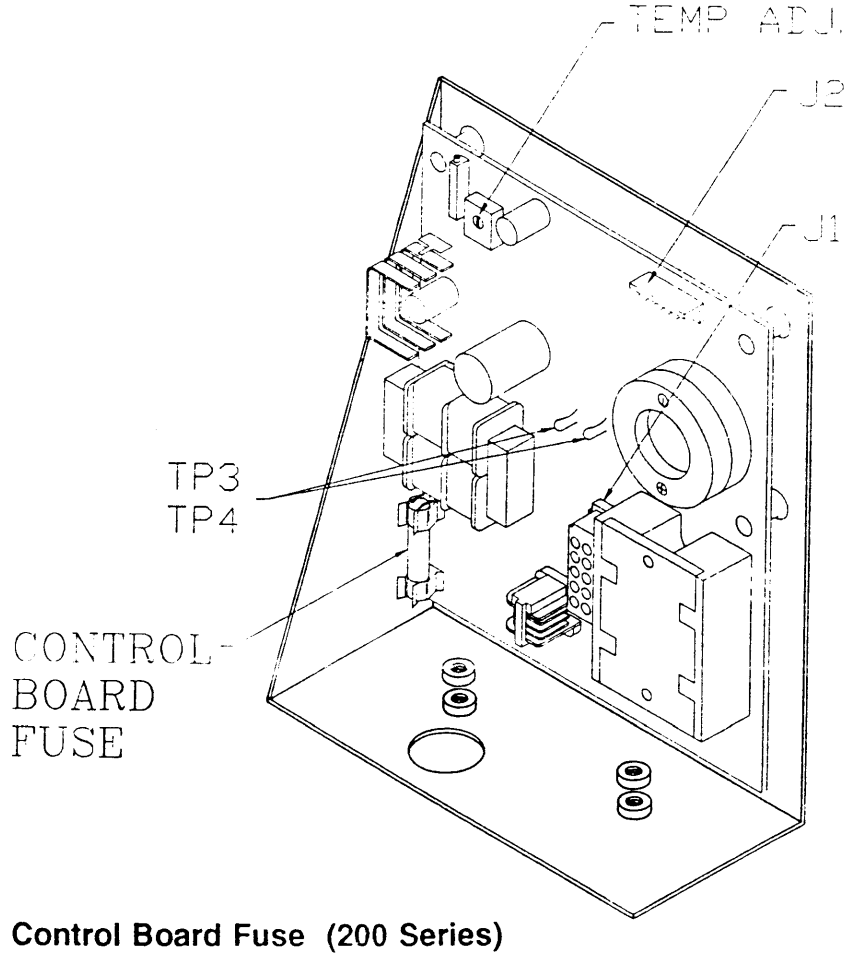


Figure 2. Control Board Fuse (200 Series)

FILTER REPLACEMENT (200 SERIES)

Change the filter every 6 months or 500 hours.

Disconnect power to the Warming Unit before changing the filter. To change the filter, open the rear access panel of the Warming Unit by removing the four (4) Phillips head screws. Lift out the old filter and insert a new one into the filter frame observing the airflow direction (See Figure 3). Close back panel and secure with the four (4) Phillips head screws (See Figure 3). Record the maintenance action taken and the hours of operation on the Maintenance Record located at the back of this manual.

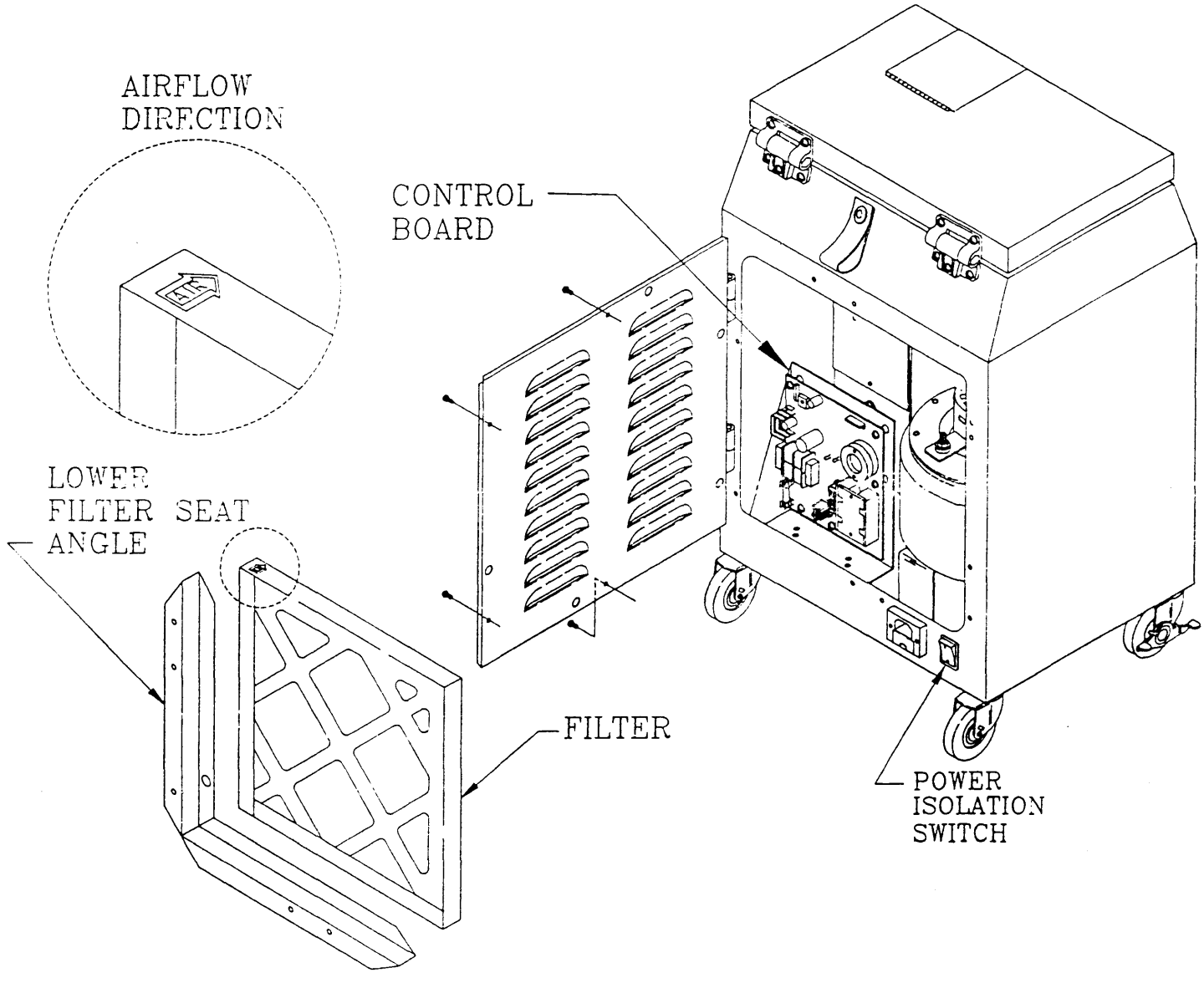


Figure 3. Control Board and Filter Replacement (200 Series)

FUSE REPLACEMENT (500 SERIES)
(Units Not Equipped with a Power Entry Module)

These instructions apply for Warming Units containing internal power fuse holders.

The **power fuses** are located inside the filter housing.

1. Disconnect the power to the Warming Unit before replacing fuses.

2. To replace the power fuses, remove the service lid by lifting it.

3. Remove the nut from the top of the filter and remove the filter.

4. Unscrew the fuse holder cap, remove the old fuse, and replace the fuse as marked.

5. Ensure that the filter is seated firmly to fully engage the interlock switch. The Unit will not run unless interlock switch is properly seated (See Figure 6).

6. Replace the fuse holder cap and the filter.

7. Secure the filter nut and the service lid.

8. Record the maintenance action taken and hours of operation on the Maintenance Record located at the back of this manual.

9. Plug in the Warming Unit and turn it on to ensure that the filter interlock is properly seated.

10. The **control board** fuse is located on the control board. To gain access to control board see steps 1-8 in the Warming Unit Temperature Test (500 Series) section of this manual.

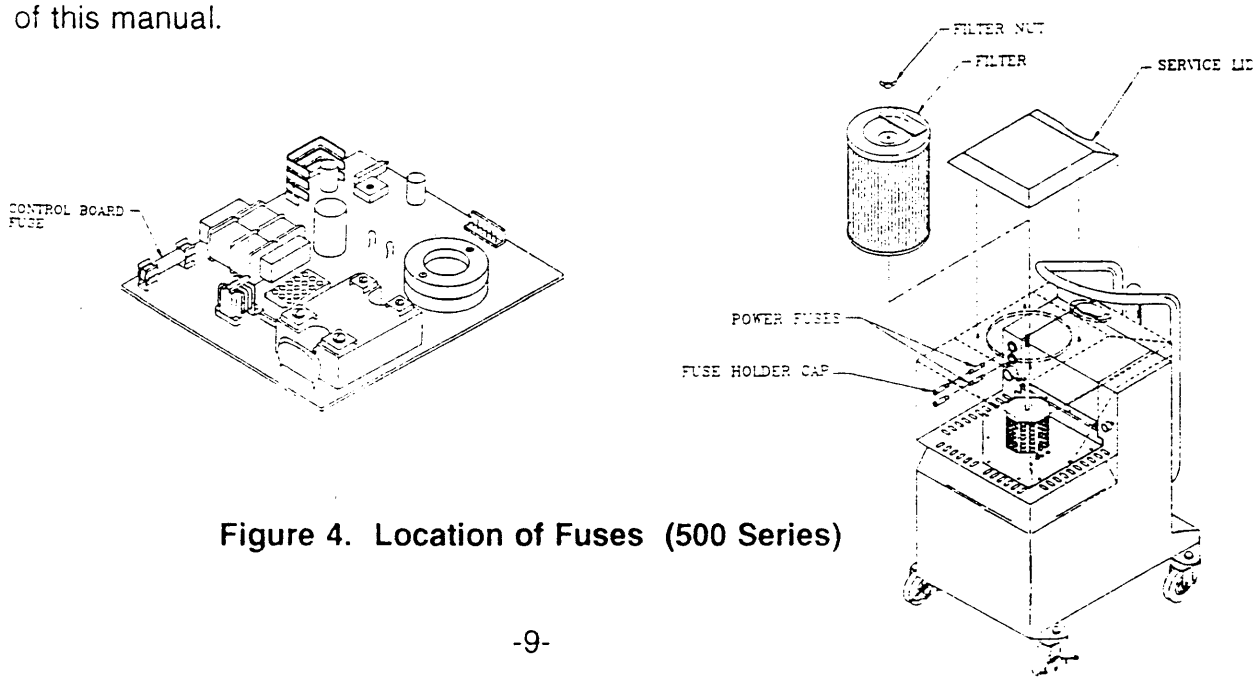


Figure 4. Location of Fuses (500 Series)

FILTER REPLACEMENT (500 SERIES)

Change the air filter every 6 months or 500 hours.

1. Make sure to disconnect power to the Unit before changing the filter.

2. Remove the service lid by lifting it. Remove the nut from the top of the filter (See Figure 5).

3. Remove the old filter and record the hours indicated on the hour meter on the Maintenance Record at the back of this manual.

4. Install the new filter. Make sure that the filter is seated firmly to fully engage the interlock switch. The Warming Unit will not run unless the interlock switch is properly engaged.

5. Secure the filter nut and the service lid.

6. Plug in the Warming Unit and turn power "ON" to make sure that the filter interlock is properly seated.

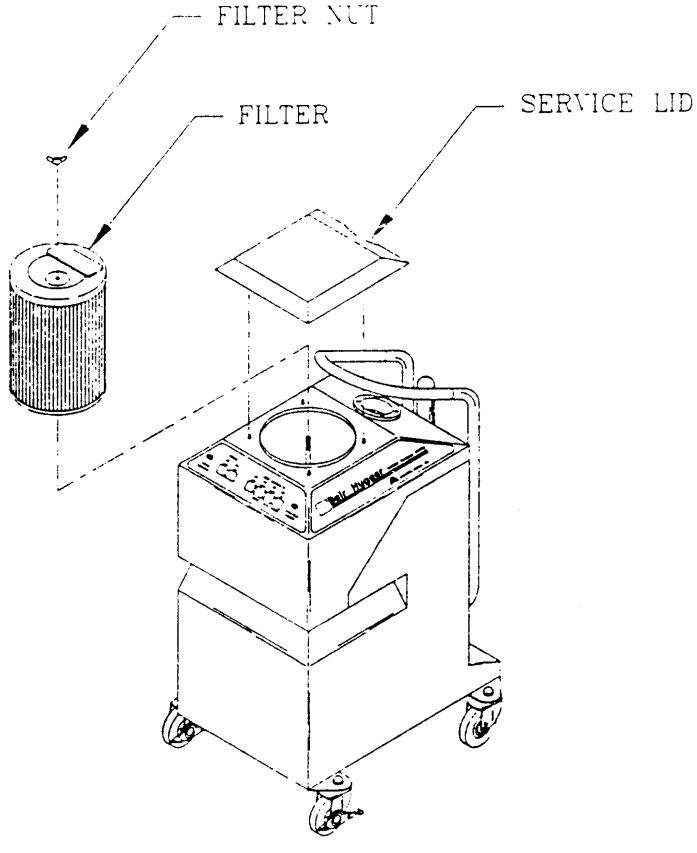


Figure 5. Filter Diagram (500 Series)

WARMING UNIT TEMPERATURE TEST (200 SERIES)

TESTING NORMAL OPERATING TEMPERATURES

Attach the hose to the Temperature Test Kit, turn power "ON", and select the temperature setting to be tested. After approximately five (5) minutes running time, check the temperature on the Test Kit. The temperature should match the manufacturer's specifications (See Temperature Specifications).

TESTING OVER TEMPERATURE ALARM

CAUTION: To avoid electrical shock, unplug the Warming Unit during test preparation.

Note: To perform the test, a short jumper wire with alligator clips is needed to attach to test points 3 and 4 (TP3/TP4) on the control board (See Figure 2).

1. Open the rear access panel of the Warming Unit by removing the four (4) Phillips head screws.

2. Remove the filter.

3. Identify the control board and attach the jumper to TP3 and TP4 (See Figure 2).

4. Insert the Warming Unit hose into the receiver of the Temperature Test Kit, plug the Warming Unit into the proper wall receptacle, and turn power "ON".

Note: Heat setting will not affect the over temperature test as the control circuit has been bypassed.

5. When the alarm activates, allow the Unit to cycle two more times before noting the temperature on the test kit (See Safety System Specifications). **The first over temperature cycle may be higher when started from a cold start.**

6. Turn the power "OFF" and unplug the Unit. **Remove the jumper,** replace the filter, and close the rear access panel, securing with the Phillips head screws.

WARMING UNIT TEMPERATURE TEST (500 SERIES)

TESTING NORMAL OPERATING TEMPERATURES

Attach the hose to the Temperature Test Kit, turn the power "ON", and select the temperature to be tested. After approximately five (5) minutes running time, check the temperature on the Test Kit. The temperature should match the manufacturer's specifications (See Temperature Specifications).

TESTING OVER TEMPERATURE ALARM

CAUTION: To avoid electrical shock, unplug the Warming Unit during test preparation.

Note: To perform the test, a short jumper wire with alligator clips is needed to attach to test points 3 and 4 (TP3/TP4) on the control board (See Figure 7).

1. Remove the service lid (See Figure 7).
2. Remove the filter and the hose.
3. Remove the screws securing the power head.
4. Unplug the two power head plug connectors by depressing the two finger grips on the plug assembly.
5. Remove the power head.
6. Remove the screws that secure the filter seat and remove the filter seat.
7. Identify the control board and attach the jumper to TP3 & TP4 (See Figure 7).
8. Replace the filter seat.

Note: There is no need to secure the filter seat as the jumper will need to be removed after test completion.

9. Pull upward on the interlock switch plug until it clicks into extended position (See Figure 6). This will bypass the interlock safety mechanism and allow the Unit to operate.
10. Replace the power head and reconnect the power head plug connectors. A click indicates that the connections are secure.

11. Reconnect the end of the hose with the pre-drilled holes to the Temperature Test Kit and connect the other end of the hose to the Warming Unit.

12. Turn the Warming Unit on. When the alarm activates, allow the Unit to cycle two more times before noting the temperature on the test kit (See Safety System Specifications). **The first over temperature cycle may be higher when started from a cold start.**

13. When the over temperature alarm is verified, unplug the Warming Unit and **remove the jumper** from the control board.

14. Reverse steps 1-8 to ensure that all connections are made. Reconnect the power head plug connectors. A click indicates that the connections are secure.

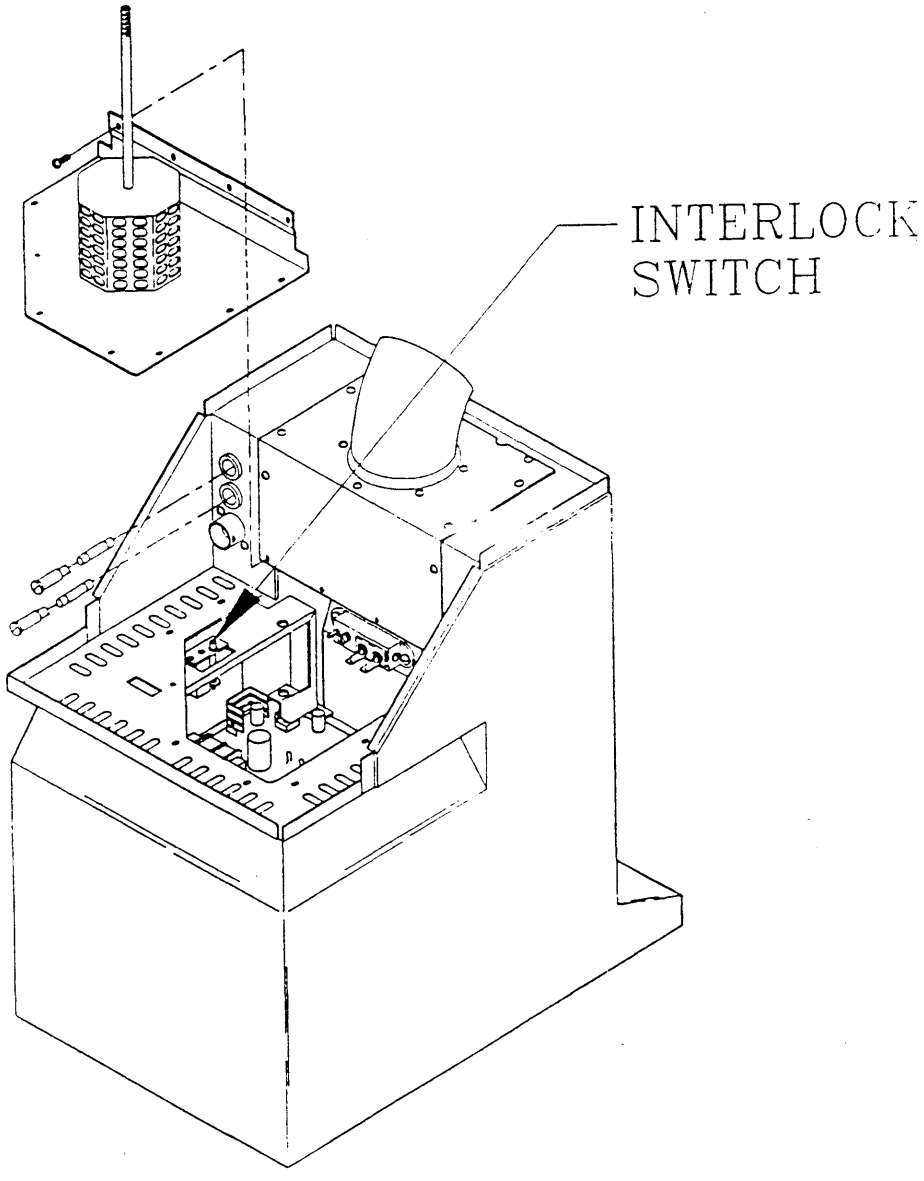


Figure 6. Interlock Position (500 Series)

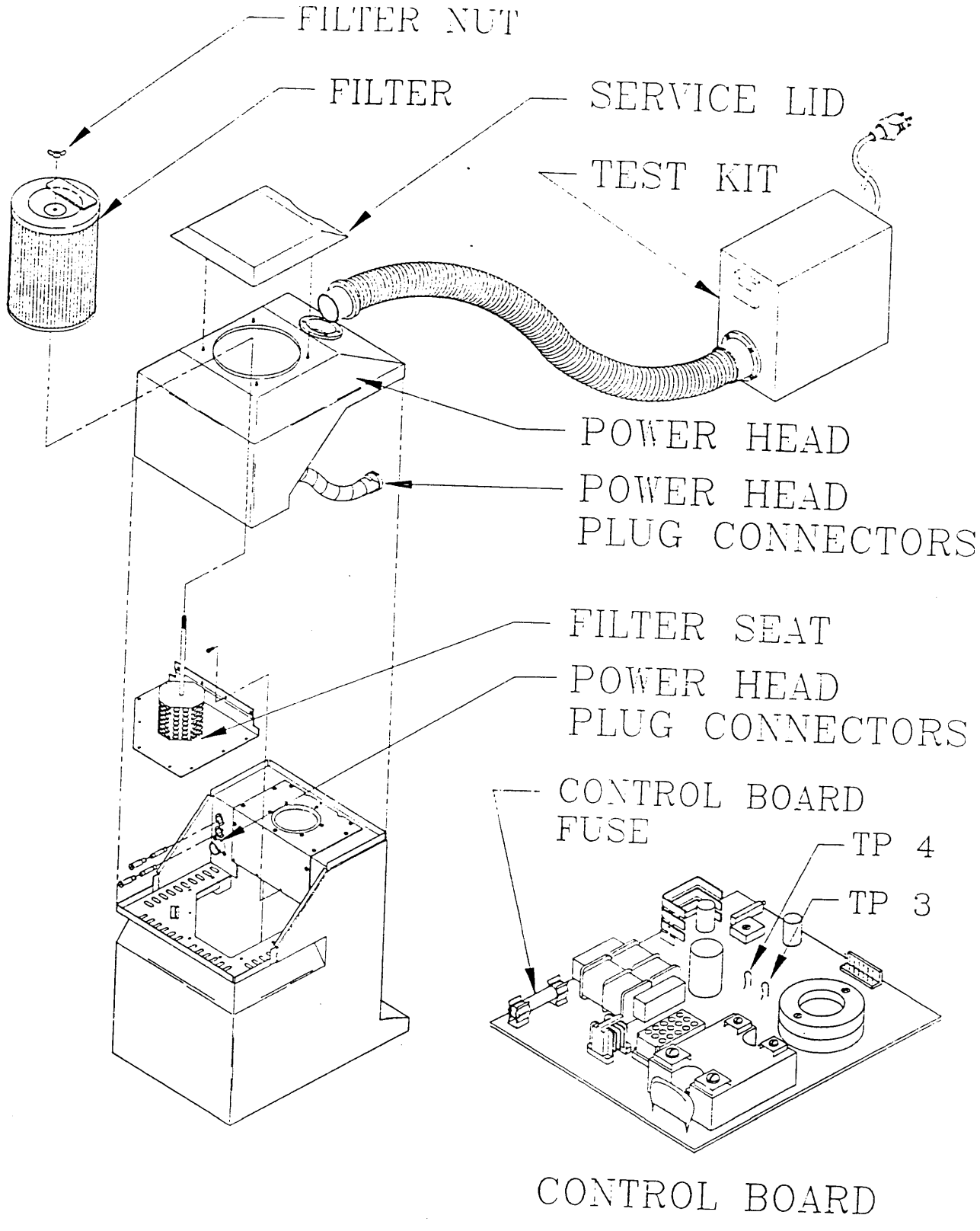


Figure 7. Component Location for Over Temperature Test (500 Series)

TROUBLESHOOTING AND SERVICE DATA

PROBLEM	POSSIBLE CAUSE	REMEDY
The Warming Unit does not turn on.	No power to outlet.	Check the power at the outlet.
	Damaged or unplugged power cord.	Replace the cord or plug in the Unit.
	Blown power fuses.	Replace the blown fuses.
	Poor or loose wire connections.	Check the connectors at the power entry module (if so equipped).
		Check connector J1 on the control board. Reattach any loose connections at the terminal block (See Figure 12).
	Loose plug on connector J1 (See Figure 12).	Ensure connector J1 is firmly seated.
	Filter not engaging interlock switch (500 Series).	Reposition filter.
	Loose cord at power entry module.	Firmly seat the power cord.
The Warming Unit circulates air but it does not heat.	Control board fuse blown (See Figures 2 & 4).	Replace the blown fuse.
	Poor connections of the thermocouple (TC) leads on the control unit (See J2, Figure 12).	Reattach any loose connections.
	Open thermocouple circuit.	Replace the thermocouple assembly.
	Open thermostat.	Let the Unit cool and restart.
	Poor power head plug connection (500 Series, See Figure 7).	Disconnect and reconnect, snapping the power head plug firmly in place.

PROBLEM	POSSIBLE CAUSE	REMEDY
The Warming Unit heats on some temperature settings but not on others. Example: the Warming Unit works on low setting but not on high setting.	Loose connection at connector J2 (See figure 12).	Reattach any loose connections.
	Loose wire connections at the desired heat setting.	Reattach any loose connections.
	Poor power head plug connection (500 Series, See Figure 7).	Disconnect and reconnect, snapping firmly in place.
Unit alarms upon startup.	Open thermostat.	Let the Unit cool and restart.
	Poor wire connections at thermostat.	Reattach any loose connections to thermostat (See Figure 8).

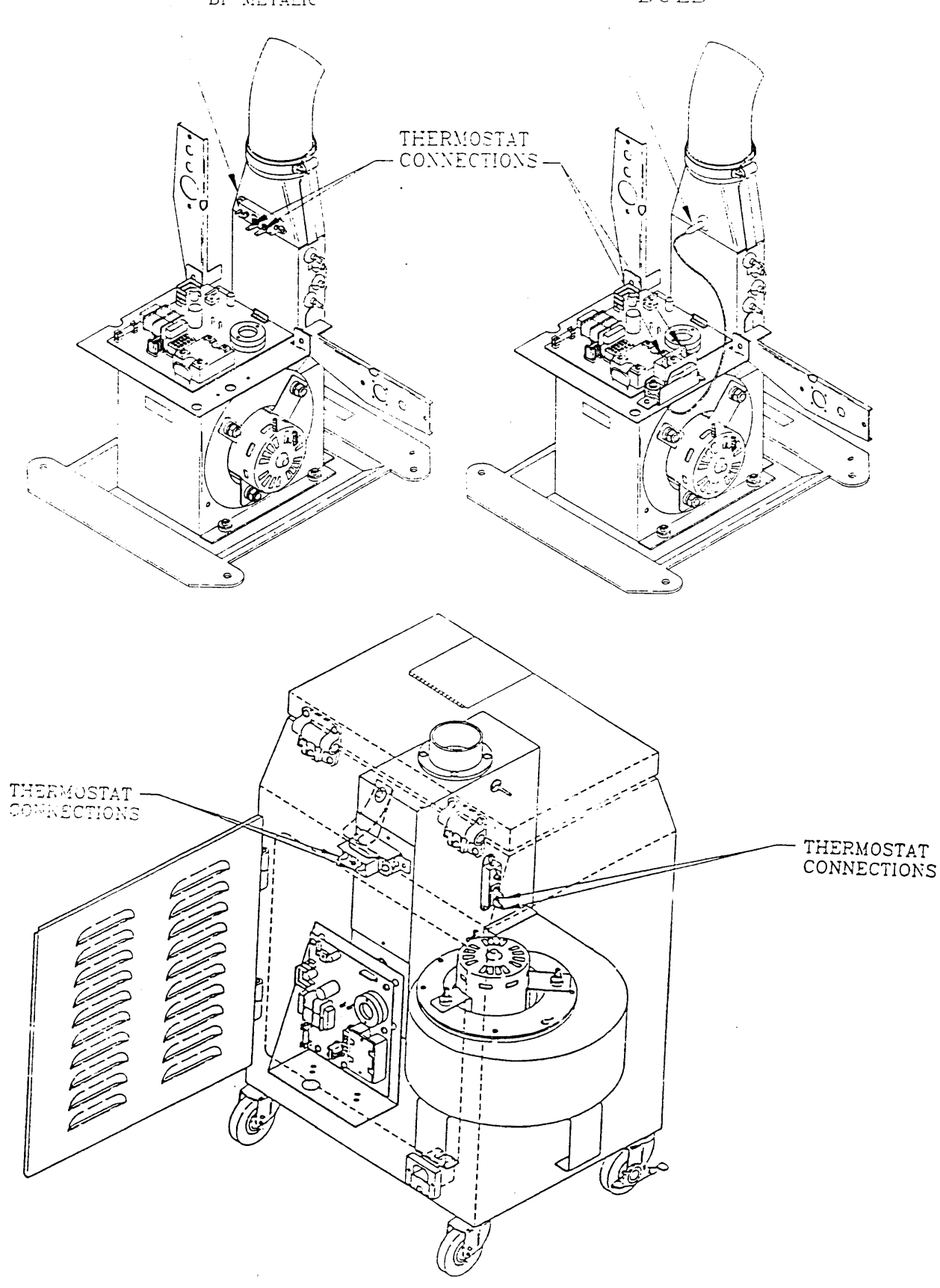


Figure 8. Thermostat Locations

PARTS LIST 200 SERIES

DRAWING BALLOON #	DESCRIPTION
4	Wire Shield
11	Instruction Label
13	Caster Set (2)
14	Caster Set Locking (2)
15	Friction Hinges
16	Control Switch
19	Fuse Holder
21	Strain Relief
22	Power Fuses
28	Power Cord Strap
29	Hose Assembly
30	Heater Outlet Cap
34	Control Unit
39	Lid Gasket Assembly
43	600W Heater
44	Bulb Type Thermostat
46	Red Light
47	Green Light
50	Thermocouple
51	Bi-Metallic Thermostat
52	Hour Meter

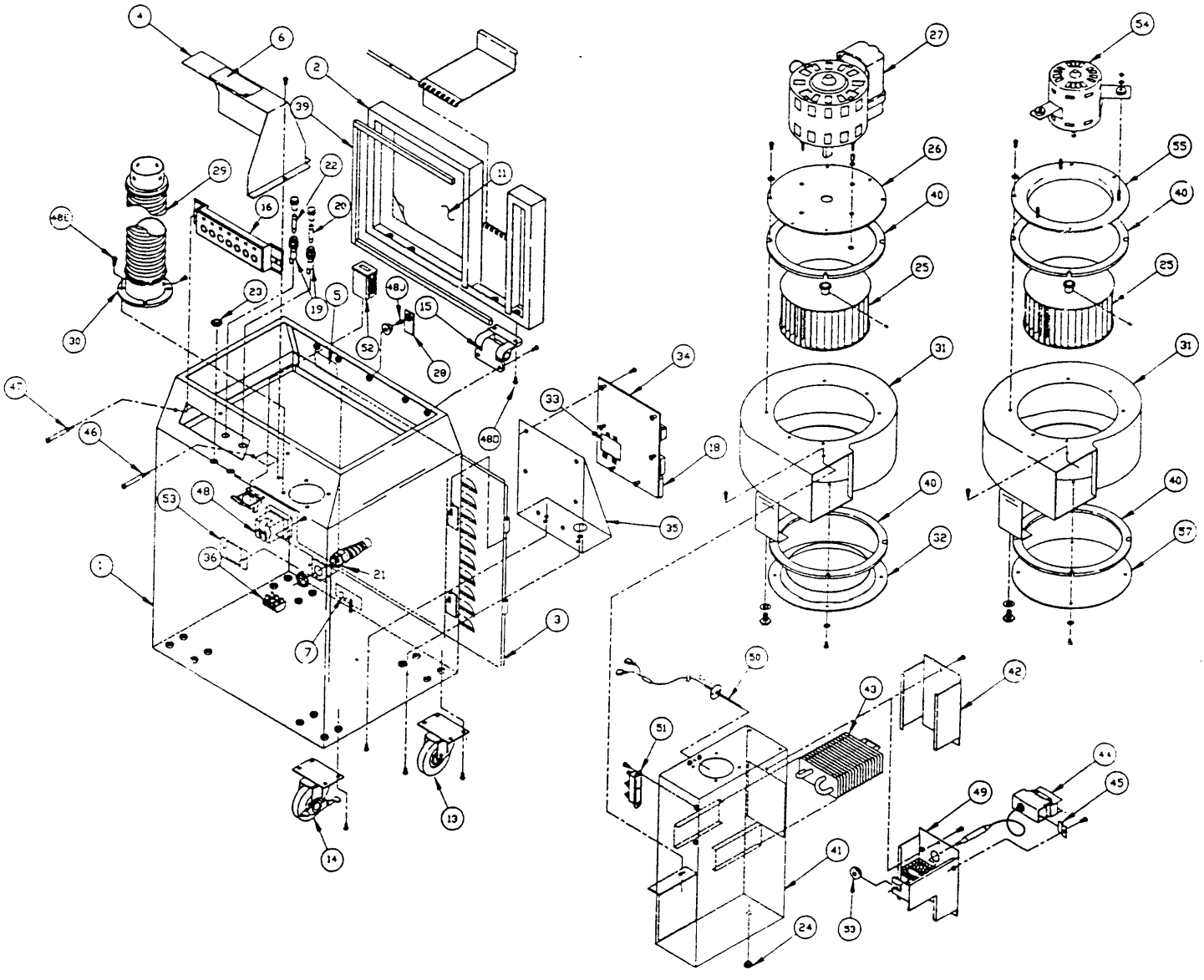


Figure 9. Exploded Drawing (200 Series)

PARTS LIST 500 SERIES

DRAWING BALLOON #	DESCRIPTION
7	Power Fuse
12	Red Indicator Light
13	Green Indicator Light
14	Bulb Type Thermostat
15	Hour Meter
18	Control Unit
21	Thermocouple
24	Cabinet, Lower
25	Service Lid
27	Base Plate
28	Upper Filter Seat
28	Lower Filter Seat
29	Filter .2 Micron
30	Caster
31	Caster Locking
32	Blower Housing
33	Blower Mounting Bracket
34	Heater Cartridge
35	Exhaust Tube
36	Straight Hosewrap
37	Handle
38	Hose Coupling Flange
39	Blwr Mtg Brkt Spacer Grommet
40	Front Control Label
41	Logo Label Set (2)
43	Motor
44	Blower Wheel Alum High Speed
49	Power Head Plug Connection

DRAWING BALLOON #	DESCRIPTION
See Figure 6	Power Head Plug Connection
57	45° Dual Tab (2)
67	Warning Label
68	Hose Wrap Ball Plugs
72	Blower Inlet Ring
76	Interlock Switch
77	1/4-20 x 6" Stud
78	Filter Securing Nut
79	Bi-Metallic Thermostat
80	Hour Meter Bracket
81	Control Board Fuse

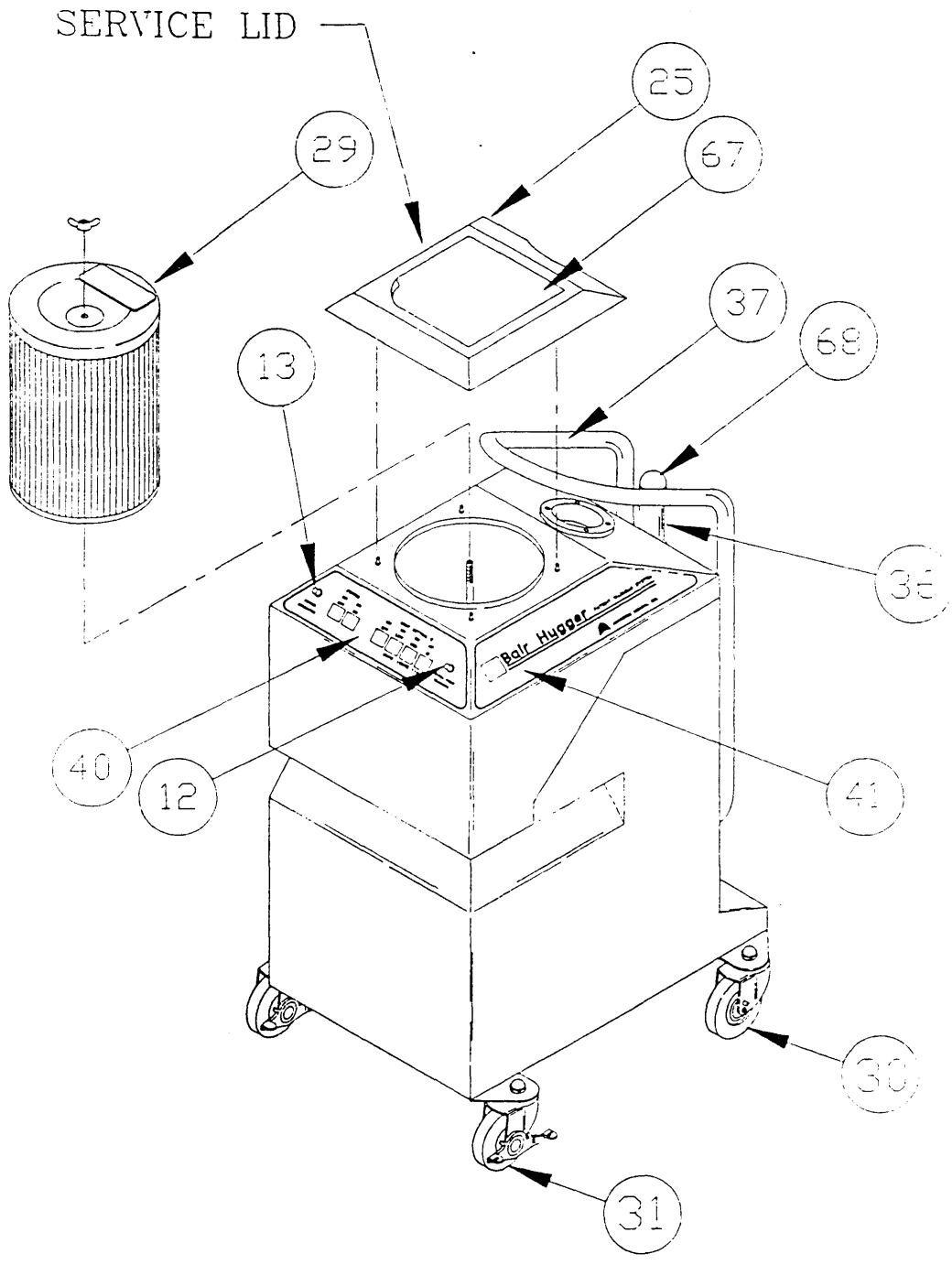


Figure 10. Exploded Drawing #1 (500 Series)

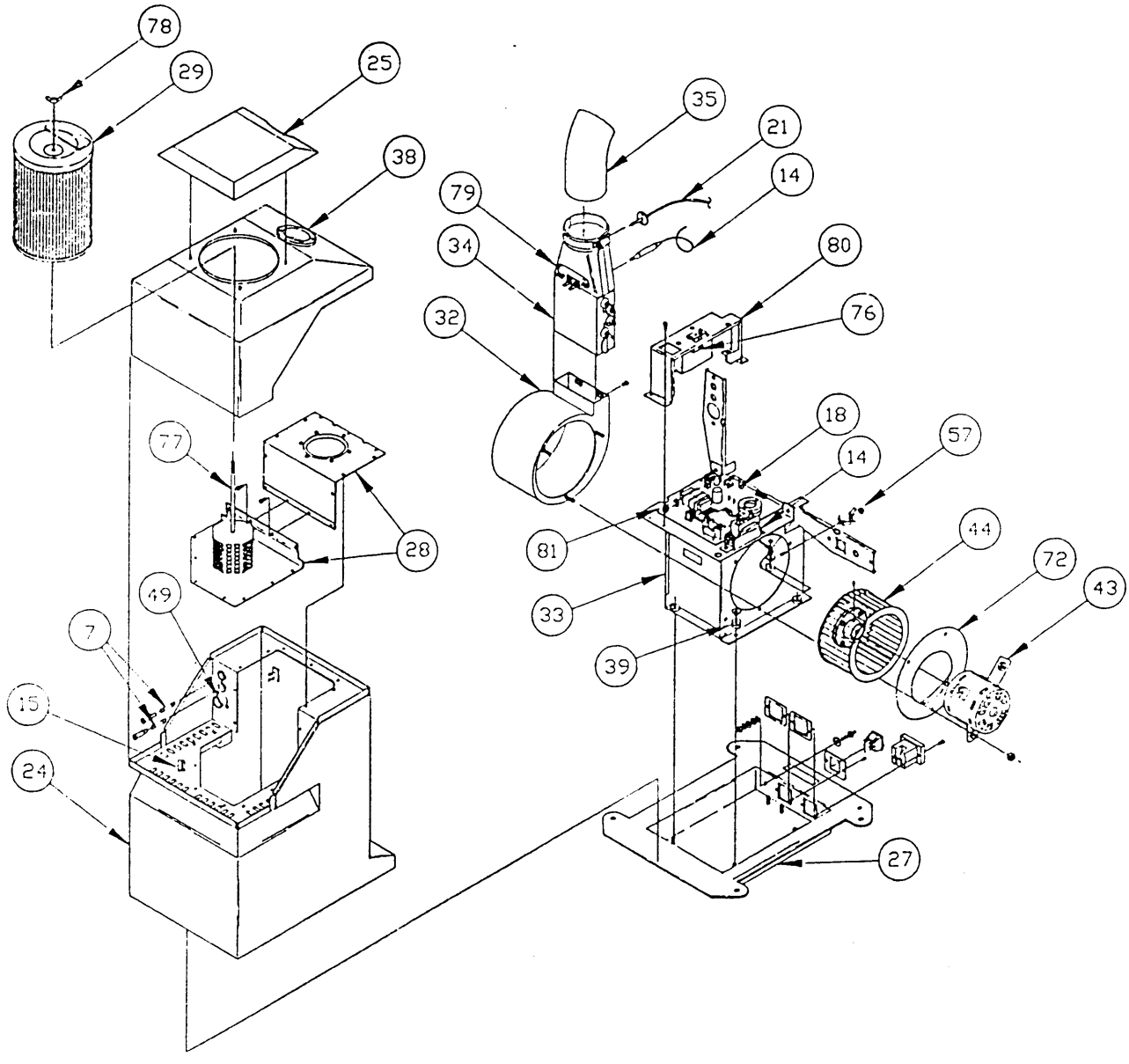


Figure 11. Exploded Drawing #2 (500 Series)

SPECIFICATIONS
Bair Hugger® Patient Warming Systems

PHYSICAL CHARACTERISTICS

MODEL	DIMENSIONS
200 Series	26" high x 12" deep x 22" wide 66 cm high x 30 cm deep x 56 cm wide
250, 275 Series	26" high x 12" deep x 16" wide 66 cm high x 30 cm deep x 41 cm wide
500 Series	25" high x 14" deep x 15" wide 63 cm high x 34 cm deep x 39 cm wide
MODEL	**WEIGHT**
200 Series	31.8 kg 70 lbs
250, 275 Series	29.5 kg 65 lbs
500 Series	20.4 kg 45 lbs

ELECTRICAL CHARACTERISTICS

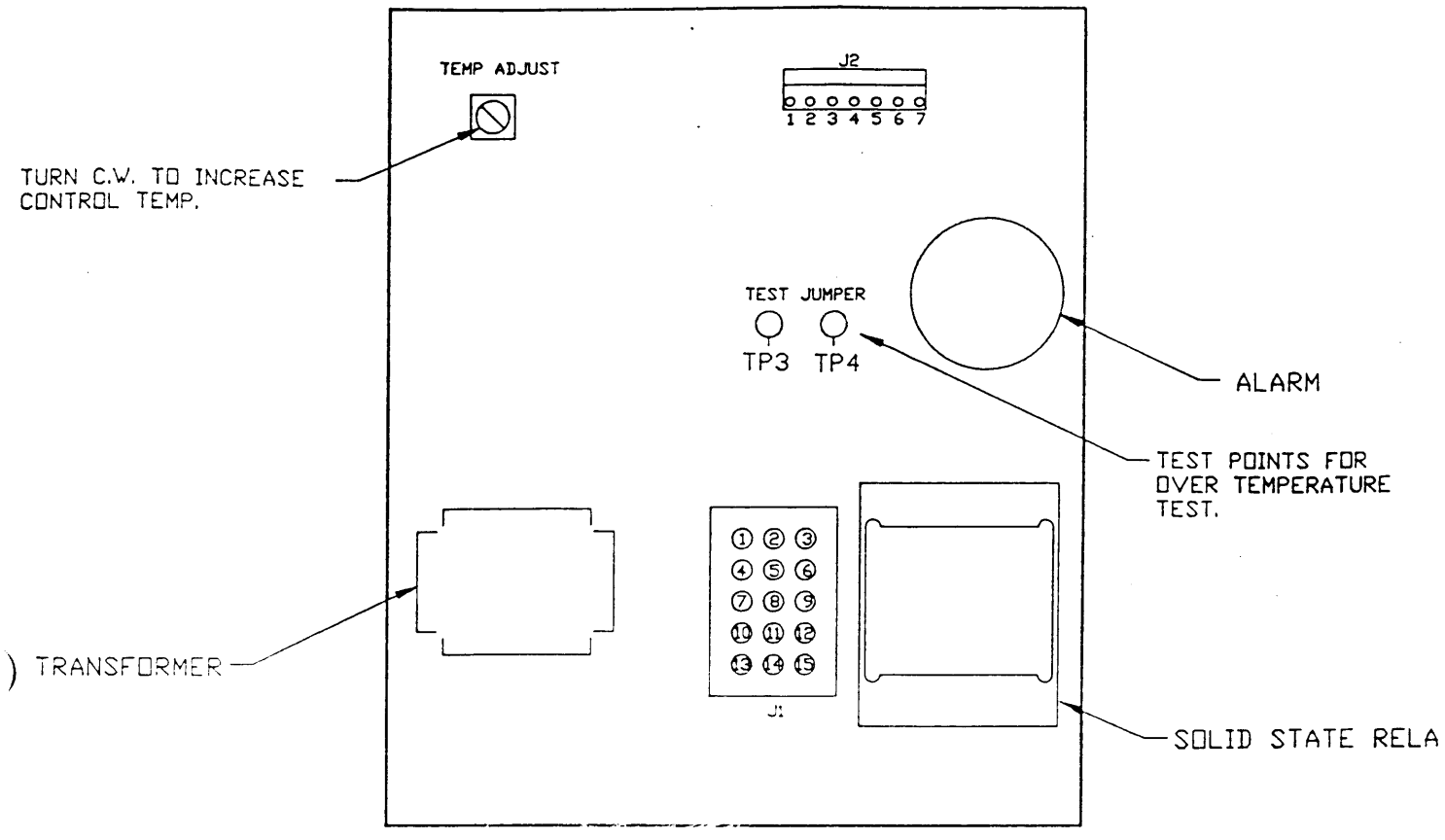
MODEL	DEVICE RATINGS
200 200E 200J	125VAC, 60Hz, 7.0 Amps 240VAC, 50Hz, 3.5 Amps 100VAC, 50/60Hz, 8.0 Amps
250 250E, 275 250J	125VAC, 60Hz, 7.0 Amps 240VAC, 50Hz, 3.5 Amps 100VAC, 50/60Hz, 8.0 Amps
500 500E 500J	125VAC, 60 Hz, 9.5 Amps 240VAC, 50 Hz, 4.5 Amps 100VAC, 50/60hz, 10.0 Amps
MODEL	**LEAKAGE CURRENT**
All Models	Meet hospital and regulatory standards for leakage current.
MODEL	**FUSES**
200/250 200E/250E/275 200J/250J	10 Amp and 63 mA 5 Amp and 32 mA 10 Amp and 63 mA
500 500E 500J	10 Amp and 63 mA 5 Amp and 32 mA 10 Amp and 63 mA
MODEL	**MOTOR**
200,250 200E, 250E, 200J, 250J	1/20 HP, Single Phase, 1750 rpm Motor 1/20 HP, Single Phase, 1500 rpm Motor
500 500E, 275, 250 (rev e) 500J	1/30 HP, Single Phase, 3600 rpm Motor 1/30 HP, Single Phase, 3000 rpm Motor 1/30 HP, Single Phase, 3000 rpm Motor
MODEL	**HEATER**
All Models	A sealed tube heating element

TEMPERATURE CHARACTERISTICS

MODEL	OPERATING TEMPERATURES
Average temperature under the Warming Blanket.	
200 Series (Except 275)	High: 110°±5°F 43°±3°C Med: 100°±5°F 38°±3°C Low: 95°±5°F 32°±3°C
Average temperature at the end of the hose.	
500 Series, 275	High: 110°±5°F 43°±3°C Med: 100°±5°F 38°±3°C Low: 95°±5°F 32°±3°C

SAFETY SYSTEM

MODEL	THERMOSTAT
All Models	Bulb Type and/or Bi-Metallic.
MODEL	**OVER-HEAT WARNING**
All Models	If the temperature gets too high, the over-heat warning light on the front panel will illuminate and the alarm will sound. The heat will shut off and the blower will continue to run.
MODEL	**HIGH TEMPERATURE THERMOSTAT**
200 Series (Except 275)	The thermostat interrupts power to the heater and activates the alarm at a preset high temperature of 56°±3°C (132°±5°F) at the end of the hose, as determined by the Augustine Medical, Inc. test kit.
275, 500 Series	The thermostat interrupts power to the heater and activates the alarm at a preset high temperature of 53°±3°C (127°±5°F) at the end of the hose, as determined by the Augustine Medical, Inc. test kit.

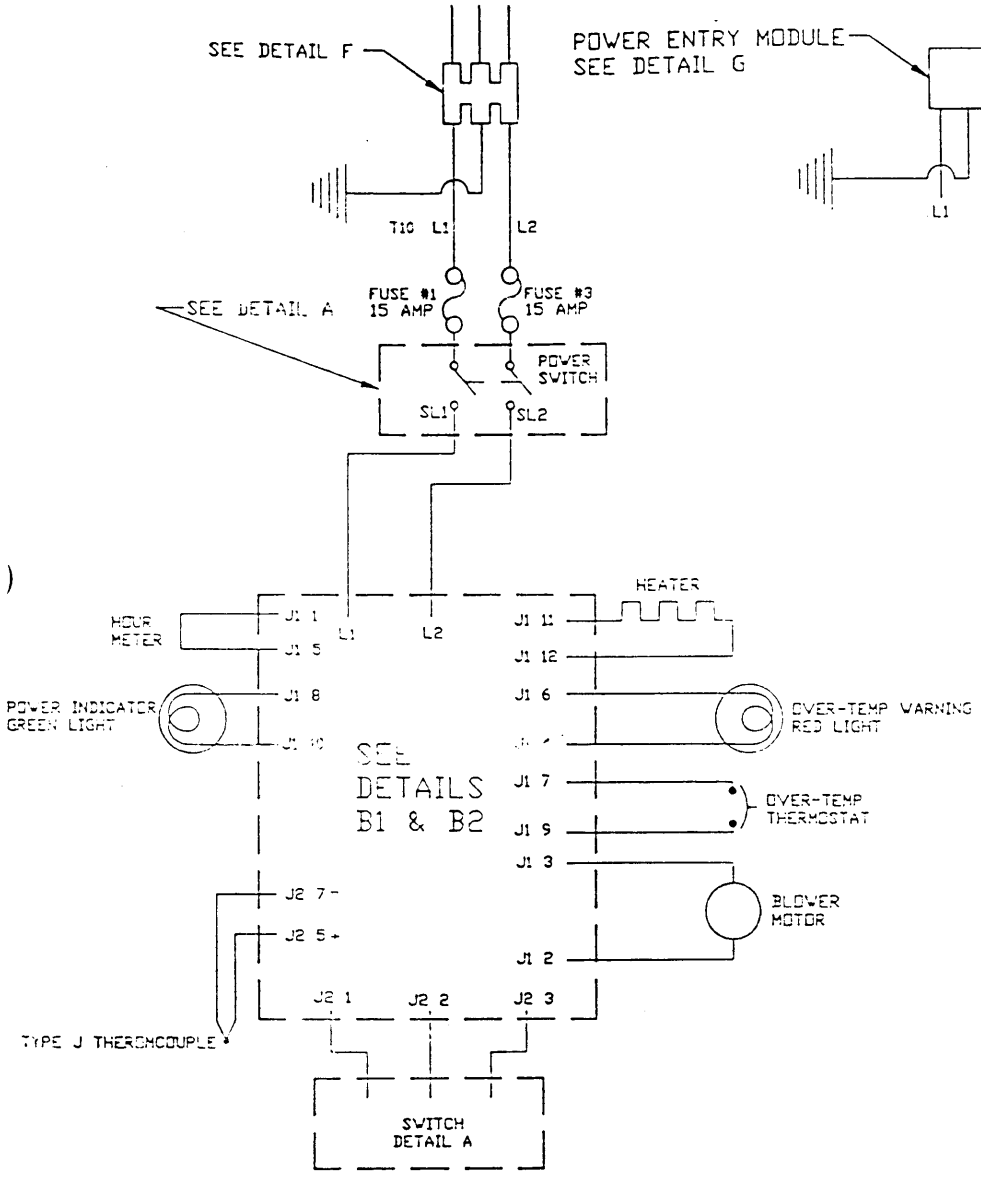


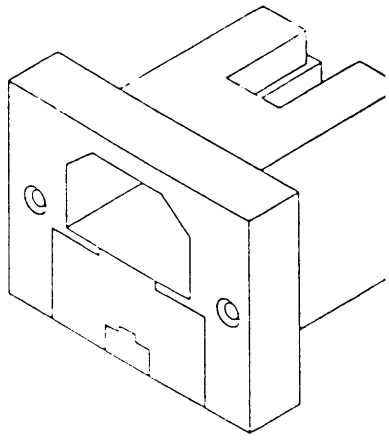
J1 CONNECTIONS J2

J1		J2	
1	HOUR METER L1	1	LO SET POINT
2	BLOWER MOTOR L2	2	MED SET POINT
3	BLOWER MOTOR L1	3	HI SET POINT
4	RED NEON L1	4	SET POINT SWITCH COMMON
5	HOUR METER L2	5	THERMOCOUPLE (TC+)(WHITE)
6	RED NEON L2	6	NOT USED
7	OVER TEMP THERMOSTAT	7	THERMOCOUPLE (TC-)(RED)
8	GREEN NEON L2		
9	OVER TEMP THERMOSTAT		
10	GREEN NEON L1		
11	HEATER L2		
12	HEATER L1		
13	L1 INPUT		
14	L2 INPUT		
15	IS NOT USED		

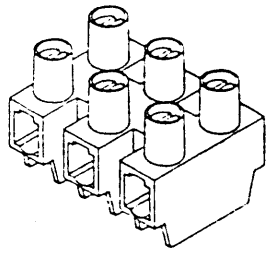
DETAIL B-2

Figure 12. Control Board Connectors





DETAIL G



DETAIL F

Figure 13. Schematic Drawing (200/500 Series)

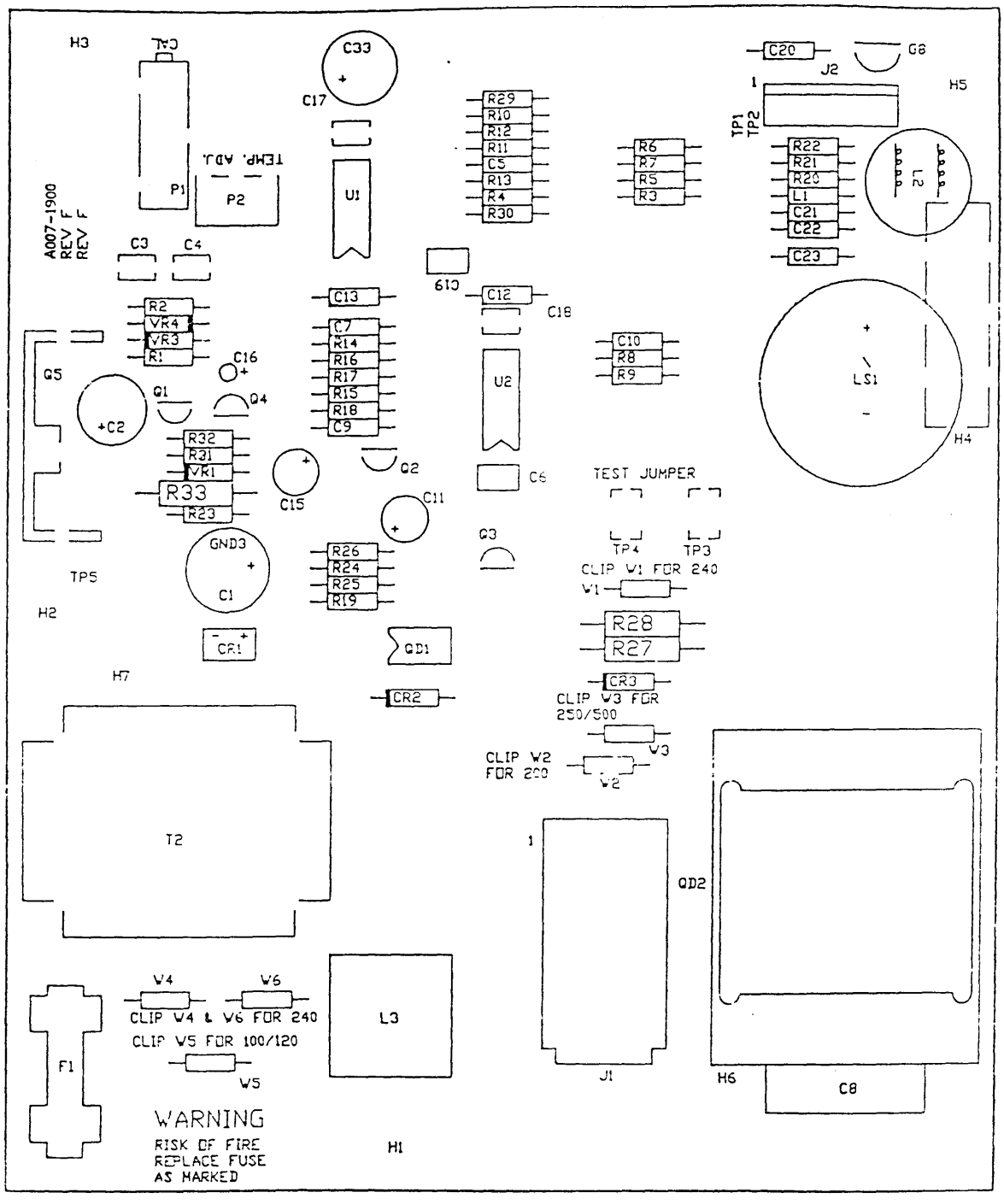


Figure 14. Control Board Layout